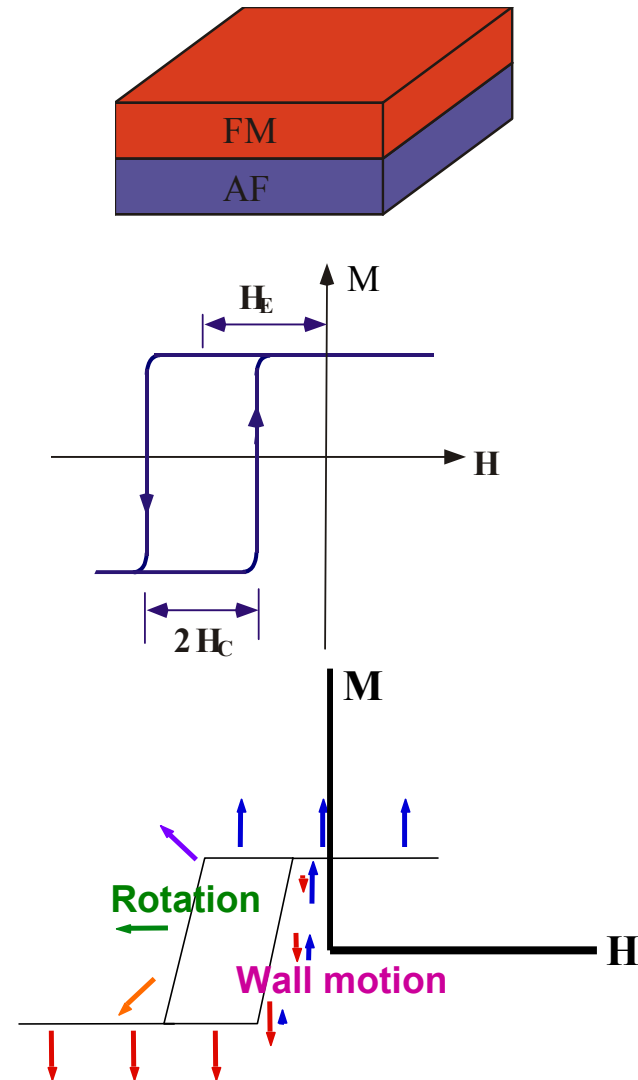


Exchange Biased Nanostructures

Ivan K. Schuller, UCSD, DMR-0071968

Exchange Bias is an important phenomenon which is not well understood, however is used in a large number of important applications such as sensors, computer memories and recording media. This phenomenon manifests itself as a shift (H_E) in the hysteresis (M-H) loop of **Ferromagnetic(F)**-**Antiferromagnetic(AF)** bilayers. Magnetic materials, in the absence of a magnetic field (H), are not magnetized globally, because they are divided into little magnets (“domains”) pointing in random orientations in space. The ordering into a single direction occurs in two limiting ways: 1) Domains rotating (“**domain rotation**”) or 2) “Domain walls” between the domains moving (“**domain wall motion**”). It was generally believed and experimentally found that all magnetic materials, change their magnetization (M) as a magnetic field (H) is varied, always the same way.

We found that in **Exchange Biased** systems unexpectedly the M reversal occurs by different mechanisms when the H is decreased from positive to negative field and vice versa. As the H is decreased from positive field the reversal occurs by **domain rotation** the other way by **domain wall motion** (see figure). This changes drastically the way we think of the reversal mechanism in novel magnetic materials and has important implications for magnetic applications.



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Outreach:

- 1) We have organized a symposium between actors, historians and scientists related to the play Copenhagen. This was a major event, televised and will soon available for web streaming.
- 2) We are in the process of developing ideas for a 30 minute movie dealing with Magnetic Nanostructures in collaboration with UCSD-TV.
- 3) The PI has given several talks on Spintronics or Nanostructures at local organizations interested in science.

Educational:

Undergraduates: Doug Bird, Randy Dumas, Vincent Cerimele

Post-docs: Johannes Eisenmenger

